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BULLETIN OF THE
U.S. DEPARTMENT OF AGRICULTURE

No. 49

Contribution from the Bureau of Plant Industry, Wm. A. Taylor, Chief.
January 14, 1914.

THE COST OF RAISING A DAIRY COW.[1]

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INTRODUCTION.

One of the most important and vital problems in the dairy industry of this country is the production of heifers to replace poor animals and the older cows as they reach the end of their economic usefulness. The extent of this problem may be better realized when one considers that, according to recent statistics, there are in the territory of the United States, not including the Philippine Islands, 21,749,651 dairy cows.[2] Considering the average productive life to be even as high as eight years,[3] each year 2,718,706 heifers must be raised to maintain the present number of dairy cows. If the total number of cows is increased, then even a larger number of heifers must be raised annually.

The raising of these heifers for the country as a whole is an important economic problem to the dairyman, and the cost of their production is a large item in keeping down his profits.

In the following pages is outlined the cost problem of raising a heifer, and figures are presented showing the results of investigations into the cost of producing heifers on a Wisconsin farm, covering a period of five years. During this period 117 calves were selected for raising. Three consecutive yearly groups of calves are followed from birth to the time of entering the dairy herd.

The heifers raised on this farm are Jerseys. While the cost of raising dairy cows of the different breeds may not vary greatly, the Jersey is one of the smallest breeds; and if there is any variation the cost for other breeds would probably be a little higher.

Note.—This bulletin is based on the records kept on a Wisconsin dairy farm. The conclusions reached regarding costs are considered to be applicable to the raising of heifers on dairy farms in the East North Central and Middle and North Atlantic States.

[1] This work was made possible through the hearty cooperation of Mr. C. I. Brigham, who kept the complete daily records, and Miss Lillian Church, assistant in farm accounting, who rendered valuable assistance in posting and tabulating the original records covering a period of four years.

[2] U. S. Department of Agriculture, Yearbook for 1912, p. 666.

[3] U. S. Department of Agriculture, Bureau of Statistics, Bulletin 88.

THE COST-OF-PRODUCTION PROBLEM.

The items that go to make up the cost of producing a dairy heifer are feed, bedding, labor (both man and horse), shelter, use of equipment, interest on money invested, miscellaneous charges (including veterinary services, registration fees, and other minor items), a share of the general overhead expenses of the entire farm business, and a charge to cover losses by death and discarding. To these must be added the item of initial value, because a calf worth raising has a value at birth.

The records and accounts needed to obtain the necessary data to calculate these costs are: (1) Feed records, (2) labor records, (3) financial accounts, and (4) inventories.

THE FEED RECORD.

The feed record must show the daily ration, including the number of pounds of each kind of feed, beginning with the first milk the calf drinks and continuing until it is grown and enters the herd. The milk and grain should be weighed daily, while the roughage need be weighed only three times a month at 10-day periods and also whenever any change is made in the ration. The difficulty of getting this record will depend upon the number of different feeds in the ration, the number of times the ration is changed, and the regularity of the feeder. A simple blank with pencil attached fastened in a convenient place in the feeding room or calf barn will suffice for this purpose.

THE LABOR RECORD.

The labor record should contain the number of hours of all labor, both man and horse, used directly and indirectly in caring for the growing calves. By indirect labor is meant the hauling on the farm of feeds and materials that are to be used by the calves. Complete daily reports from each workman of all the labor on the farm are preferable, as then there is no chance to overlook any item of labor cost. By having the complete number of hours of paid labor, together with the factors making up the cost, the exact rate per hour of man and horse labor can be determined. However, if labor records on calves alone are desired, the increased accuracy from complete records on the whole farm would not justify the extra work required.

THE FINANCIAL ACCOUNTS.

Complete financial accounts are necessary. These should include all expenditures relating to calves, such as the purchase of pails, repairs on all items of equipment used, veterinary fees, and other miscellaneous items occurring throughout the period of growth. A complete financial account of the entire farm business is preferable,

so that the general overhead expenses of the farm, a share of which is chargeable to the calves, may be determined.

INVENTORIES.

A complete detailed inventory should be taken at the beginning of each year. This should include the live stock, feed, and everything used in connection with the calf-raising portion of the dairy enterprise. These inventories are of the utmost importance, as they form the foundation for many of the cost items other than feed, labor, and cash expenses.

RECORDS ON THE BRIGHAM FARM.

By cooperating with Mr. C. I. Brigham, a dairyman located in Dane County, Wis., the Office of Farm Management of the Bureau of Plant Industry has obtained complete cost records not only for the raising of calves but for the entire farm business, beginning with the year 1908. Great care has been taken by Mr. Brigham and his workmen to record the consumption of all feeds given to each class of live stock and to make complete daily records in detail of all hours of labor expended and other items. From these records it has been possible to work out complete cost statements on the raising of heifers.

The dairy stock on this farm normally consists of 50 high-grade and pure-bred Jersey cows, 2 registered bulls, and about 40 head of calves and young stock.

The practice in this herd is to have all the cows freshen, beginning September 1, and the heifers are bred to drop their first calves and enter the herd at the age of 2 years. The record of a yearly group of calves is started September 1, and the variation in numbers by new calves entering the group throughout the month is eliminated by tabulating the records on the basis of feeding days. In practice it is not possible to have all the 2-year-old heifers enter the herd in the fall of the third year, but those that do not enter the herd at that time are added to the yearling group.

On this farm at the beginning of the feeding period the group of calves is composed of heifers and a few of the best pure-bred bulls which are to be sold for breeding purposes. These bulls are usually disposed of before the end of the first year.

The numbers of calves handled for the different periods during the five years covered by records on the Brigham farm are presented in Table I.

TABLE I.—*Classification of 117 calves handled during five record years on the Brigham farm.*

Year of birth.	Number selected.	Died or sold.	Entered second year.	Bought or dropped back.	Total for second year.	Died or sold.	Entered herd under 2 years old.	Fed full period.
1907			28		28	3		25
1908	23	5	18	[1] 10	28	[2] 4	1	23
1909	23	3	20	4	24	[3] 1	8	15
1910	19	[2] 6	13		13	1		12
1911	21	4	17					
Total	86	18	96	14	93	9	9	75

[1] Three bought and seven 2-year-olds dropped back from the 1907 group.
[2] One died.
[3] One butchered.

Of the calves included in this record, 86 were selected at birth, 28 yearlings from 1907 were on hand on September 1, 1908, when the records were started, and 3 were purchased, making a total of 117 calves for the five years. Out of the 86 selected, 18 were dropped out before they were 1 year old. Eleven of these were pure-bred bulls. Any of these bulls that were not sold before the age of 6 months were separated from the heifers in the feeding pen, and after June 1 a separate record was kept of them. Of the 7 heifers, 1 died and the other 6 were discarded and sold.

Including the 3 yearlings that were purchased and the 28 in the 1907 group, there were 99 of the 117 to enter the second record year. Of these 99, the 1911 group of 17 dropped out because records are not yet available, 3 bulls of the 1907 group were sold, 5 discarded heifers were sold, and 1 died. Thus, of the 117 calves, 73 heifers were raised during the five years.

By means of Tables II to VII, inclusive, the problem of the cost of production is illustrated by complete records of one group of calves from birth in September, 1909, up to the time they entered the herd at 2 years of age in September, 1911. The quantity of each feed consumed was obtained by actual weighing, the prices shown in Tables III and VI being the local prices of feeds at the farm, as reported at the end of each month. This gives a more accurate feed cost than would be obtained by the use of a yearly average price, as several of the more expensive feeds vary in price from month to month.

The labor shown in these tables represents the actual number of hours of man labor and horse labor expended in caring for the calves and has been obtained from the daily labor-report sheets of all workmen on the farm.

The cost rate for man labor is 12 cents per hour for the period covered by the records herein presented. The man rate is obtained

by dividing the total cost of this labor by the total hours of paid labor for the entire farm. This total cost is made up of cash wages, board, lodging, and other privileges provided. The accurate rate for the Brigham farm, although varying slightly from year to year, is very close to 12 cents per hour for all the years. The cost rate of horse labor, determined in the same way, is equal to the total cost of this labor divided by the total number of hours of horse labor for the entire farm business. The cost includes labor, feed, shoeing, interest, depreciation, and charges for the use of shelter, harness, and other horse equipment needed for the maintenance and use of the horses, and other miscellaneous items. The rate per hour as figured for 1909 is 10 cents, and the rates for the other years are so close to this that a 10-cent rate is taken for the entire period.

Because of the variation in the number of animals throughout the year, the average per month, as well as the yearly average, is obtained on the basis of feeding days.

RECORDS OF THE 1909 GROUP OF CALVES.

QUANTITY OF FEED CONSUMED DURING THE FIRST YEAR.

The figures in Table II represent the average daily quantity of each feed consumed per head for the different months of the first year. The number of calves varies from 1 to 18 for the first month and then remains around 20 to 23 for the rest of the year. The yearly average on the basis of feeding days is 20.42. In making and adjusting the ration, six classes of feed are used—whole milk, skim milk, hay, corn silage, grain mixture, and pasture.

For the first few days the calf receives only warm whole milk and is fed three times a day. After this it is fed milk only morning and evening. During the whole-milk period the calf receives from 6 to 12 pounds daily, according to age and size. When it is about 30 days old the ration is gradually changed from whole milk to skim milk. At first about 1 pound of skim milk is substituted and the quantity is gradually increased, so that in about a week the calf is getting skim milk only. About the time of this change grain mixture is added to the ration and the quantity is gradually increased. Mixed hay, consisting mostly of clover, is also added and kept in the bunk before the calf for the first few months so that it may help itself at will. In June alfalfa is substituted. The skim milk is brought back from the village creamery and during the fall and winter months it has to be warmed before feeding, a small steamer being kept for this purpose.

TABLE II.—*Quantity of feed per day fed during different months to a yearly average of 20.42 head of calves.*

Year and month.	Average number fed.	Whole milk.	Skim milk.	Mixed hay.	Corn silage.	Grain mixture.	Pasture.
1909.		*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Days.*
September	6.3	11.6	0.1	.....	.....	.....	.....
October	18	6.2	2.9	0.4	.....	3.4	.....
November	22	1.3	9.3	.7	0.3	1.8	.....
December	23	.5	10.5	1.8	.....	2.0	.....
1910.							
January	23	.2	14.5	3.0	1.2	2.4	.....
February	23	.....	11.8	3.1	1.7	2.4	.....
March	23	.....	11.8	4.8	1.2	2.4	.....
April	23	.....	18.8	4.2	2.3	2.1	.....
May	23	.....	12.4	5.5	2.8	2.1	31
June	20.7	.....	1.8	[1] 2.3	1.1	.7	30
July	20	.....	.....	.....	.....	.....	31
August	20	.....	.....	.....	.....	.....	31
Total per head per year	.....	342	3,165	857	353	547	123

[1] Alfalfa hay.

It is interesting to note the addition of corn silage in the fifth month, which provides bulk and succulence. The grain mixture consists of three different concentrates in approximately the ratio of 4 parts of bran, 5 parts of oats, and 1 part of oil meal. There was little variation in the composition of the mixtures for the different months. It is an important item in the ration during the entire feeding period. The variation in the quantity of different feeds is largely due to natural variations in the needs of the growing calves.

COST OF FEED FOR THE FIRST YEAR.

In Table III is presented the cost of the different feeds, to show the relative importance of these feeds for each month in making up the total feed cost for the year. The most expensive period in the calf's life is during the time it is wholly or in part dependent upon whole milk. The feed cost alone for the calf up to 6 weeks of age is about $5.50, and when 8 weeks old $6, which represents 22½ and 24½ per cent, respectively, of the yearly cost of $24.58. It is the practice with some farmers to sell calves for veal when from 6 to 8 weeks old, and, although where this is the practice the calves are fed a larger proportion of whole milk and the feed cost thereby increased, these figures on the feed cost for veal are suggestive.

Inasmuch as the farm affords a wide range of woodland pasture, the calves are turned out about as early as the grass starts to grow, which is about May 1 in most years. However, it is necessary to continue feeding a full ration in the barn for nearly a month and then gradually to reduce the quantity until the pasture will furnish a full feed. From June 10 until fall the calves are wholly dependent

upon pasture. (Fig. 1.) The feed cost per calf for the first month, as shown in Table III, is in reality too high. This is caused by there being a much larger number of calves fed exclusively on whole milk during the latter part of the month. As shown in this table, there is an average of only 6.3 head for the whole month, while there actually were only 1 or 2 at the beginning and 18 at the end. The fact that the calves are fed whole milk for only about two weeks makes the cost per head appear too high for the month. Where the numbers remain fairly constant, as they do after the first month, the monthly averages per head are true weighted averages. However, the sum of these monthly averages can not be expected to agree exactly with the weighted averages for the year.

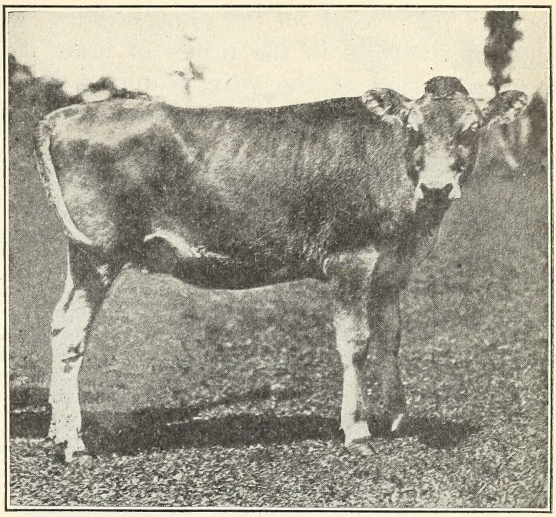

FIG. 1.—A heifer calf at 10 months of age. During the summer months the calves are on pasture. This is representative of the size and condition of the calves at this age on the Brigham farm.

TABLE III.—*Relative feed cost per head of calves during the first year.*

Year and month.	Average number fed.	Whole milk.	Skim milk.	Mixed hay.	Silage.	Grain mixture.	Pasture.	Total.
1909.								
September	6.3	$5.26	$0.01	$0.01	.....	$0.02	.....	$5.30
October	18	2.86	.18	.05	.....	.14	.....	3.23
November	22	.64	.56	.09	$0.01	.68	.....	1.98
December	23	.27	.65	.23	.....	.77	.....	1.92
1910.								
January	23	.08	.90	.38	.07	.98	.....	2.41
February	23	.....	.66	.34	.10	.85	.....	1.95
March	23	.....	.73	.53	.07	.93	.....	2.26
April	23	.....	1.13	.51	.14	.78	.....	2.56
May	23	.....	.77	.69	.17	.83	$0.30	2.76
June	20.7	.....	.11	.40	.07	.28	.50	1.36
July	20	.....	.....	.....	.....	.....	.50	.50
August	20	.....	.....	.....	.....	.....	.50	.50
Yearly cost per head	.....	5.22	6.33	3.56	.70	6.94	1.83	24.58

The yearly totals show that the whole milk represents 21.3 per cent of the feed cost, while the skim milk represents 25.7 per cent,

making the total cost of the milk 47 per cent of the feed item for the first year. The grain mixture is of next importance to milk, amounting to 28.2 per cent of the total cost of feed. The variation in cost of each feed for the different months is in direct proportion to the quantity fed, except for the grain mixture, which is affected also by slight fluctuations in the prices of bran, oats, and oil meal. The cheapest period of the year is during the summer months, when pasture makes up a part or the whole of the feed cost. The drop in the totals of feed for the month of February is due to the shorter month.

The prices of feeds are best discussed in connection with Table XIV (p. 21).

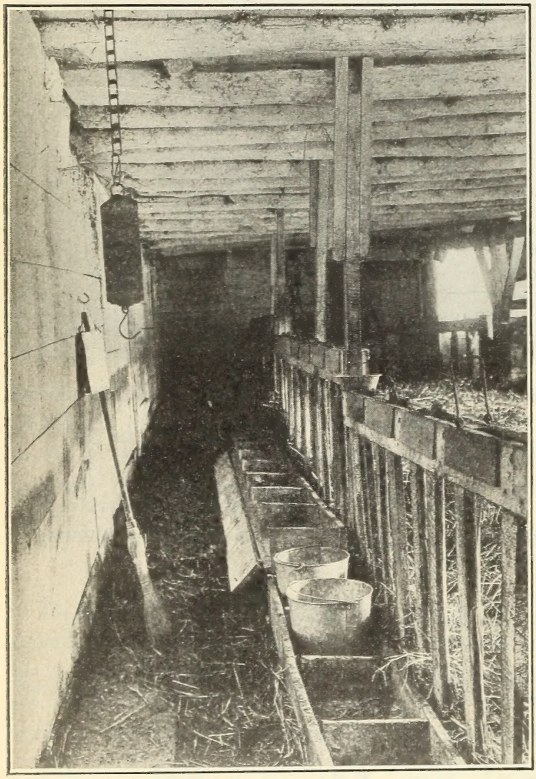

FIG. 2.—The interior of the calf barn, showing the stanchions and feeding trough. The calves are fastened in the stanchions at meal time and the pails of milk set in the trough in front of them.

HOURS OF LABOR AND THEIR COST FOR THE FIRST YEAR.

The total number of hours of labor for the first year and its cost are given by months in Table IV. All the time required for the direct care of the calves is included and also the time taken to mix and haul feeds to the calf barn. The greater part of the man labor is spent in feeding and bedding. The calves are fed twice daily with the exception of the first few days, when it is necessary to feed the new calves at noon also. The feeding is done quite regularly, usually between 7 and 8 o'clock in the morning and again between 4.30 and 6 o'clock in the evening.

The steam heater for warming the skim milk is located at some little distance from both the dairy house and the calf barn, and thus extra steps are required to carry the milk at feeding time. The calves are fastened in stanchions at meal time, and each pail of milk is set in the feed trough, which keeps it from being upset (fig. 2). After

this they are fed grain, and later when all are through eating they are released. As the hay storage space is not large enough in this barn for the yearly supply for the calves, toward the latter part of the winter it is necessary to replenish the supply from stacks in the field. Horses are used for work of this kind. The large amount of labor in March is due to hay hauling and the getting of the yearly fuel supply for heating the milk.

TABLE IV.—*Average number of hours of man and horse labor per calf and its cost for the first year for an average of 20.42 head of calves.*

Year and month.	Average number fed.	Man labor.		Horse labor.	Total cost.[1]
		Per month.	Per day.		
1909.		*Hours.*	*Minutes.*	*Hours.*	
September	6.3	6.5	13	.....	$0.78
October	18	3.3	6	0.04	.40
November	22	4.4	9	.16	.54
December	23	4.2	8	.....	.50
1910.					
January	23	4.3	8	.25	.54
February	23	3.8	8	.48	.51
March	23	6.2	12	2.00	.94
April	23	4.3	9	.07	.52
May	23	3.9	8	.11	.48
June	20.7	.3	1	.....	.03
July	20	.....	.....	.....	.....
August	20	.....	.....	.....	.....
Yearly total per head	.....	39.90	.....	3.50	5.14

[1] Rates per hour: Man labor, 12 cents; horse labor, 10 cents.

The total amount of time required per head for the year is about 40 hours of man labor, which is about 8 minutes per day for the 9 full months in the barn. Only 3.5 hours of horse labor were required. This requirement is a variable quantity and makes only a small part of the total labor cost of $5.14 for the year. Barring the first month, when the young calves need extra attention, the labor cost for ordinary care is quite uniform for the different months of the period they are in the barn. When on pasture no labor is required, but the calves are daily under the observation of the herdsman as he cares for the herd and special attention would be given them if needed.

The first and second months stand out as the most expensive period of the year, for then the calves are dependent largely on milk and require extra attention. The combined cost for feed and labor during these two months amounts to 32.5 per cent of the yearly cost, which is $29.72.

QUANTITY OF FEED CONSUMED DURING THE SECOND YEAR.

Beginning the second year the heifers are on pasture until about November 1. They are then given the run of a small yard and open

shed near the calf barn during the winter months. The feed is entirely roughage, consisting of mixed hay and corn silage, with the addition of corn stover from January to April. About the middle of May they are again turned on pasture and receive no other feed during the summer. This makes a total of 171 days, or nearly one-half the second year, that the heifers are dependent upon pasture alone.

Table V gives the ration and the average quantity fed daily per head for the different months. Each calf consumed during the winter months an average of 1,120 pounds of hay, 3,250 pounds of silage, and 672 pounds of corn stover.

The change in numbers from the second year is due to the addition of two heifers in December, the transfer of a few head to the dairy herd to fill vacant stalls, and the butchering in March of one that proved to be undesirable.

TABLE V.—*Average quantity of feed per head per day during the second year fed to an average of 17.2 head of heifers.*

Year and month.	Average number fed.	Mixed hay.	Corn silage.	Corn stover.	Pasture.
1910.		*Pounds.*	*Pounds.*	*Pounds.*	*Days.*
September	20	.....	.....	.....	30
October	20	.....	.....	.....	31
November	20	[1] 4.7	11.4	.....	.....
December	22	7	16.2	.....	.....
1911.					
January	17.7	6.6	17.7	2.5	.....
February	16	5.8	19.4	5.1	.....
March	15.6	5.2	17.3	9.6	.....
April	15	4.4	18.6	7.2	.....
May	15	2.2	4.3	.....	18
June	15	.....	.....	.....	30
July	15	.....	.....	.....	31
August	15	.....	.....	.....	31
Total	.....	1,120	3,250	672	171

[1] Alfalfa, 2 pounds; mixed hay, 2.7 pounds.

COST OF FEED FOR THE SECOND YEAR.

In the second year the feed cost as compared with the first year is materially reduced, as shown in Table VI. This is caused by a number of factors. First, both milk and concentrates, each of which is a large item in the first year's feed cost, are omitted. Second, the pasture period is longer. Pasture is the cheapest of feeds, and the longer the stock can be kept on it the smaller will be the total yearly feed cost. On the other hand, during the second year the quantity of roughage fed is increased. However, roughage is a cheap feed, and its increased cost in the second year does not offset the decrease caused by the omission of milk and grain.

The prices for the different feeds remain the same for the whole period; hence, the cost each month varies with the quantity fed. The costs for the year are as follows: Hay, $4.60; silage, $6.50; corn

stover, $1.45; and pasture, $3.56; making a total of $16.11. This is $8.47, or 34 per cent, less than the cost of the feed for the first year.

TABLE VI.—*Cost of feed per head for the second year for an average of 17.2 head of heifers.*

Year and month.	Average number fed.	Mixed hay.	Corn silage.	Corn stover.	Pasture.	Total.
1910.						
September	20				$0.50	$0.50
October	20				.50	.50
November	20	[1] $0.66	$0.68			1.34
December	22	.86	1.00			1.86
1911.						
January	17.7	.81	1.10	$0.19		2.10
February	16	.66	1.07	.35		2.08
March	15.6	.65	1.21	.59		2.45
April	15	.53	1.12	.43		2.08
May	15	.27	.26		.50	1.03
June	15				.75	.75
July	15				.75	.75
August	15				.75	.75
Yearly total		4.60	6.50	1.45	3.56	16.11

[1] Alfalfa, 28 cents; mixed hay, 38 cents.

HOURS OF LABOR AND THEIR COST FOR THE SECOND YEAR.

The hours of labor required and the cost per head for the second year are shown in Table VII. During the 171 days the heifers were on pasture no labor was required. For the winter months they were run in sheds, and the major portion of the labor was for feeding and bedding. The hay was carried from the barn near by, and the silage and corn fodder were carried a distance of several rods for each feeding, morning and night. In the month of March, a share of the time consumed in moving hay to the barn from stacks in the field was also charged to the heifers. The amount of horse labor is variable and only slightly affects the yearly cost for labor.

TABLE VII.—*Hours of labor required and their cost per head for the second year for an average of 17.2 head of heifers.*

Year and month.	Average number fed.	Man labor.		Horse labor.	Total cost.[1]
		Total.	Per day.		
1909.		*Hours.*	*Minutes.*	*Hours.*	
September	20				
October	20				
November	20	3.54	7.1		$0.42
December	22	5.18	10.2		.62
1910.					
January	17.7	2.96	5.7	0.05	.36
February	16	2.54	5.3		.31
March	15.6	4.30	8.3	.70	.58
April	15	2.80	5.4		.34
May	15	.90	2		.11
June	15				
July	15				
August	15				
Yearly total		23.25			2.86

[1] Rate per hour: Man labor, 12 cents; horse labor, 10 cents.

The cost of labor the second year is $2.86 per head, as compared with $5.14 for the first year. The cost of both feed and labor is $18.97, as compared with $29.72 for the first year, making a difference of $10.75 in favor of the second year.

It is interesting to note a comparison of the man labor required per day for the two years.

TABLE VIII.—*Man-labor requirement per head for the first and second years in raising dairy cows.*

Year.	Total number of hours.	Average number of minutes per day for the period.	
		Full year.	When in barn.
First	39.9	6.6	[1] 8.67
Second	23.25	3.8	[2] 7.66

[1] Basis of 9 months, or 274 days. [2] Basis of 6 months, or 182 days.

The requirement and cost of labor for the entire year are much less the second year, but the requirement and cost per day in the barn do not differ materially for the two years.

FEED AND LABOR COST FOR BOTH FIRST AND SECOND YEARS.

The cost per head of feed and labor by months throughout the full two years' growth of the heifer is illustrated by figures 3 and 4. The first month is the most expensive of the calf's life. After this the cost decreases until about the third month and then gradually increases during the winter and spring until the calf is turned out on pasture. The cheapest period of the two years is during the summer months, while dependent almost entirely on pasture. The feed and labor cost increases in the second year during the early winter and, reaching its maximum in March, gradually drops off with the beginning of spring weather. The second pasture season again reduces the expense

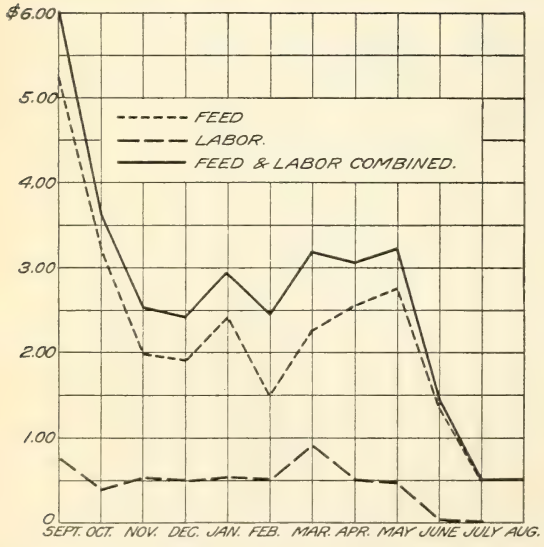

FIG. 3.—Chart showing the cost of feed and labor required in raising a dairy heifer the first year. Feed, $24.58; labor, $5.14.

for both feed and labor. Similar diagrams for both the 1908 and 1910 heifers, the total cost figures of which are given in Tables XI and XII, would correspond almost exactly with the data shown in figures 3 and 4, thus bringing out the fact that on the Brigham farm the relative cost for the different periods in the growth of a heifer is fairly constant.

The feed cost for the two years aggregates $40.69 per head, and the labor $8, making a total of $48.69 for both feed and labor.

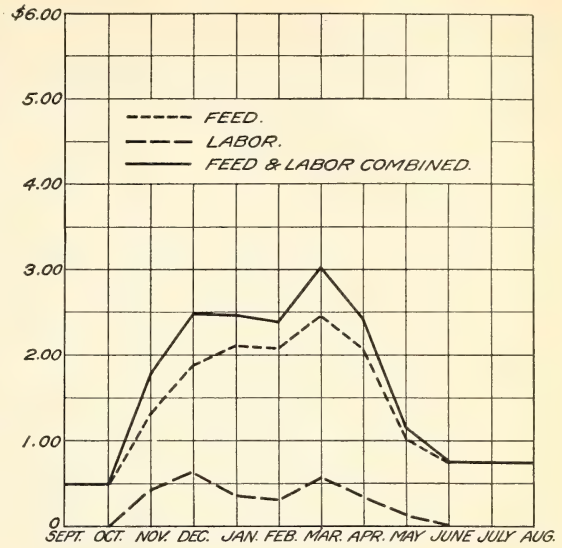

FIG. 4.—Chart showing the cost of feed and labor required in raising a dairy heifer the second year. Feed, $16.11; labor, $2.86.

TOTAL COST OF PRODUCING A HEIFER (1909 GROUP.)

Although feed and labor make up the greatest portion of the expense of raising a heifer, there are other items that must be considered in order to know the total cost of a 2-year-old heifer. These items are discussed in connection with Table IX, which gives the complete figures on this same 1909 group of calves from birth until ready to enter the dairy herd.

TABLE IX.—*Total cost of a calf from birth until it enters the dairy herd (average per head for the 1909 group).*

Item of cost.	First year.		Second year.		Total.	
	Actual cost.	Per cent.	Actual cost.	Per cent.	Actual cost.	Per cent.
Feed	$24.58	68.4	$16.11	62.8	$40.69	65.6
Labor	5.14	14.3	2.86	11.0	8.00	12.9
Interest	1.12	3.1	2.53	9.9	3.65	5.9
Buildings	1.57	4.4	.81	3.1	2.38	3.8
Equipment	.55	1.5			.55	.9
Bedding	1.00	2.8	2.00	7.8	3.00	4.8
Miscellaneous expenses	.28	.8	.16	.6	.44	.7
General expenses	1.71	4.7	1.22	4.8	2.93	4.7
Losses by death and discarding					.42	.7
Total	35.95	100	25.69	100	62.06	100
Credit, manure	3.00		5.00		8.00	
Total cost of raising	32.95		20.69		54.06	
Initial value of calf	7.00				7.00	
Total net cost	39.95		20.69		61.06	

Building charge.—The charge made against the calves for shelter includes interest and depreciation and ordinary current repairs on the barn used by the calves. Interest is figured at 5 per cent and depreciation (plus repairs) at 3 per cent on the average inventory value. The average inventory value of the barn used for the first year was $400, making a building charge of $32 for the group, or $1.57 per head. The buildings used the second year were sheds valued at $175, and 8 per cent on this valuation is only $12.80, or 81 cents per head.

Equipment charge.—The equipment used in caring for the growing calves consists of a steamer for heating milk, feeding pails, cans, and a few other minor articles. The equipment charge includes interest at 5 per cent, depreciation, and current repairs. Equipment of this kind depreciates rapidly, and therefore 20 per cent on first inventory valuation is none too large to cover this item and current repairs. The total equipment expense for the first year is $11.18, or 55 cents per head. No special equipment was used the second year.

Interest.—There is a certain amount of money tied up in the raising of the calf from birth until it enters the herd as a full-grown heifer. A nominal rate of interest on this investment must be considered as one item of cost. The difficulty that arises at this point is to know the investment upon which interest should be charged. The ordinary practice in handling farm accounts is to use one-half the sum of the inventory values taken at the beginning and end of each year, but in this case it is difficult to say what the value at the end of the first year should be.

The inventory value of a yearling beef heifer is largely determined by her market value for the meat, but with a dairy heifer there is no definite market upon which to base this valuation. In the absence of a standard basis it would seem feasible to use cost figures. Interest has already been included on equipment and buildings under charges for those items. The known items at this point upon which interest has not been figured are the cost of feed, labor, bedding, and miscellaneous expenses. These amount to $31 for the first year and represent the increase during the year. Therefore, on the basis of cost figures, the second inventory value is $31 plus the initial value, or the first inventory of $7, i. e., $38. The average value of the two inventories is, then, $22.50, and 5 per cent of this sum is $1.12, the interest charge per head for the first year.

The value at the beginning of the second year is the total cost of the first year, which is $39.95. The second value, determined in the same way as for the first-year group, is $61.08. This makes the average $50.51 and the interest charge $2.53 per head.

Bedding.—The calves were kept well bedded with straw while in the barn. The first year about one load of straw was used per calf,

and the second year two loads per head. This straw was valued at $1 per load, making a bedding charge of $1 for the first year and $2 for the second.

Miscellaneous expenses.—Miscellaneous expenses include registration fees to the American Jersey Cattle Club at $2 per head for the eligible pure-bred heifers, veterinary fees, medicine, and other minor expenses. The average expense of this kind for the first year is only 28 cents per head and for the second year 16 cents.

General overhead expense.—An item often overlooked is a share of the general overhead expense of the entire farm business. On the Brigham farm this general expense is not far from 5 per cent of the located expense; that is, the first-year group of heifers must be charged 5 per cent of the located expense, $34.24, which is $1.71. For the second year it is 5 per cent of $24.47, or $1.22.

Losses by death and discarding.—In practice a dairyman is seldom able to select a number of calves at birth and not have one or more prove to be unfit before the group reaches maturity. Some animals may die. These losses bring in an item of expense that every dairyman who raises calves should consider if he expects to come out even on the raising of his calves. The size of this item will vary materially under different conditions and with different men. Table X is here presented to show the extent of this item of loss due to death and discarding on the Brigham farm for the five years covered by records.

TABLE X.—*Loss of heifers by death and discarding during five years on the Brigham farm.*

Group.	Feeding period.	Number disposed of.	Receipts from sales.	Approximate cost.	Loss or gain.
1907	First				
1908	do				
	Second	[1] 4	$101.68	$170.00	−$68.32
1909	First				
	Second	1	32.41	42.50	− 10.09
1910	First	[1] 3	10.00	22.00	− 12.00
	Second	1	51.99	42.50	9.49
1911	First	4	170.00	120.00	50.00
Total		13	366.08	397.00	− 30.92

[1] One died.

The removal of a calf did not affect the yearly cost per head of the animals that reached maturity, because all averages per head are figured on the basis of the actual number of feeding days. During the five years covered by this report 2 heifers died and 11 were discarded and sold. The approximate average cost of the 13 is $30.54 each. The cost of the 2 calves that died amounts to $54.50, and the total for all 13 is $397; however, the receipts from the sale of the 11 reduce this amount, and the loss is only $30.92 for the 13 head.

This item of loss will vary from year to year, and in some years the animals discarded may be sold for a sum sufficient to cover the cost of their production. Because of this varying loss, the most accurate way of disposing of this item is on the basis of results extending over a period of years. For the Brigham farm this charge is worked out on the basis of losses for the five years and is only $30.92. As shown in Table I, there were 73 head to reach maturity during these years, and this loss prorated is 42 cents per head.

This is an exceedingly small loss, and on most dairy farms this item would probably be larger. There are two reasons for this loss being so small on the Brigham farm: (1) The owner was fortunate in disposing of the discards at good prices, and (2) the death rate was low. It would not have been possible to handle 117 calves and lose but 2 if the herdsman had not been both skillful and painstaking in his work. (Fig. 5.) The care and attention given by

FIG. 5.—Jersey heifers at 22 months of age. Skillful care and feeding make the heifers in excellent condition at maturity and of good size.

the owner and his herdsman to the handling of the stock are also shown by the uniformity of the feed and labor costs. (See Tables XI, XII, and XIII, pages 18, 19, and 20.)

The gross cost of raising the calf the first year is $35.95, and for the second year $25.69. The relative importance of the different items that go to make these costs are clearly shown in the percentage columns in Table IX.

The manure and litter from the calves were assumed to be worth $3 per head for the first year and $5 for the second. This gives a credit item which will reduce the gross cost of raising the heifer for the first year to $32.95 and for the second year to $20.69.

Initial value of the calf.—The cost of bull service is all charged against the cows and is an item in the cost of milk production. However, a calf worth raising has a value at birth, and in a well-managed herd of high-grade or pure-bred cattle the calves at birth should be of enough value to offset the cost of maintaining the herd bulls. In the Brigham herd the grade calves to be raised are valued at $5 each and the pure breds at from $10 to $20 each. The average initial value for the 1909 group of calves is $7 per head.

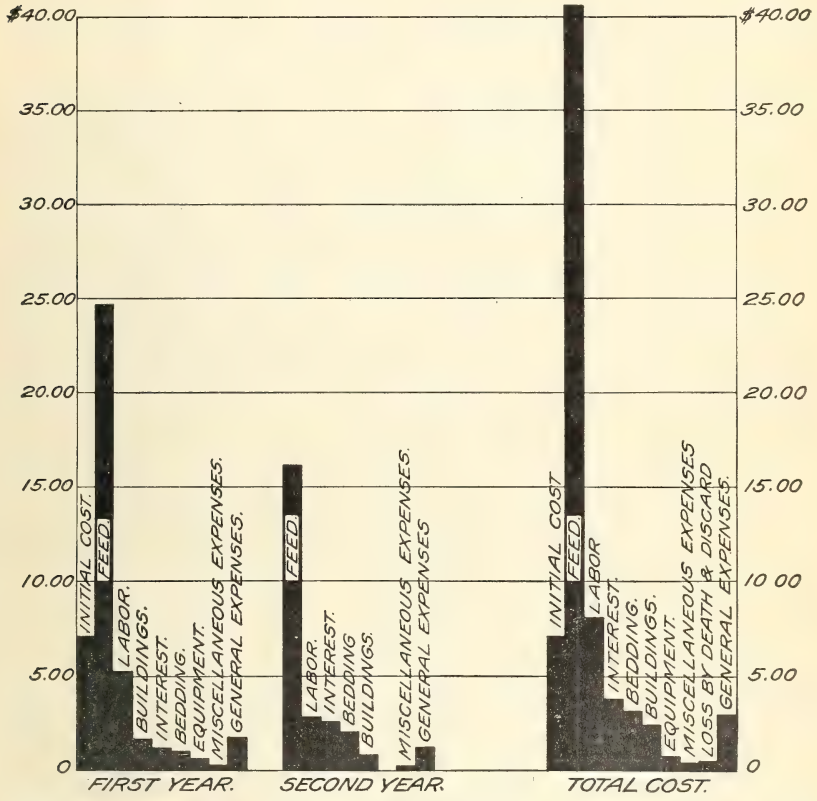

FIG. 6.—Chart showing a comparison of the items of cost in raising a heifer the first year, second year, and for the whole period of growth (1909 group).

This initial value, added to the net cost of raising, makes the total net cost of producing the heifer the first year $39.95. In other words, these 1909 heifers at 1 year of age must be valued at $40 per head to pay production expenses only. The cost the second year, though only slightly more than half that of the first year, makes the 2-year-old heifer represent $61.11.

The relative importance of the various items which make up the cost of a 2-year-old heifer is shown clearly in figure 6.

SUMMARY OF COST FOR ALL GROUPS FOR FIVE YEARS.

In the preceding pages the discussion has been confined to the cost-record data for one group of calves. It is of interest here to compare the cost for the one group with those of the other groups in the five-year period. In Tables XI, XII, and XIII are presented a summary of the cost data on all groups of calves raised on the Brigham farm from 1908 to 1912, inclusive. These tables show how closely the total cost and the items that go to make up this total compare for the different groups. The cost for any one group is typical for all groups in the five-year period.

SUMMARY OF THE FIRST-YEAR COST OF RAISING CALVES.

The cost of each class of feed given for four different groups of calves the first year (Table XI) permits a study of the relative importance of the various feeds and the effect upon the total feed cost. Over 50 per cent of the feed cost is for milk. The increase in the proportion of milk in 1910 and a change in the ratio of roughage to grain in 1911 does not reduce the total feed cost. These changes may be advisable for the good of the calf, but the effect of such changes is a subject outside the scope of this publication. It is interesting to note how closely the percentage and the cost of the different feeds compare for the different groups.

TABLE XI.—*Comparison of the cost of raising four groups of calves the first year, reduced to the per head basis.*

Item.	1908 group (average number, 17.68).		1909 group (average number, 20.42).		1910 group (average number, 14.08).		1911 group (average number, 17.43).	
	Actual cost.	Per cent.	Actual cost.	Per cent.	Actual cost.	Per cent.	Actual cost.	Per cent.
Whole milk	$4.74	19.8	$5.22	21.3	$7.36	29	$6.98	27.8
Skim milk	7.89	32.9	6.33	25.7	6.91	28	6.54	26.2
Roughage	3.76	15.7	4.26	17.4	4.94	20	6.20	24.6
Grain	6.32	26.3	6.94	28.2	4.45	18	3.78	15.1
Pasture	1.26	5.3	1.83	7.4	1.39	5	1.58	6.3
Total feed cost	23.97	100	24.58	100	25.05	100	25.08	100
Feed	23.97	71.2	24.58	68.4	25.05	69	25.08	69.8
Labor	3.59	10.6	5.14	14.3	4.84	13.3	4.23	11.8
Other costs	6.15	18.2	6.23	17.3	6.45	17.7	6.59	18.4
All costs	33.71	100	35.95	100	36.34	100	35.90	100
Credit, manure	3.00	.....	3.00	.....	3.00	.....	3.00	.....
Cost of raising	30.71	.....	32.95	.....	33.34	.....	32.90	.....

The cost for feed alone ranges between $24 and $25 for the four groups. The variation in natural conditions and the number of calves fed cause a variation in the amount and cost of labor. The labor cost for the first year ranges from $3.59 to $5.14.

The other costs seem gradually to increase with each successive year, probably owing to the increasing number of registration fees.

In all four groups the feed is about 70 per cent, the labor close to 12.5 per cent, and all others items about 17.5 per cent. The total net cost of raising the calf the first year, with the exception of the 1908 group, is close to $33.

SUMMARY OF THE SECOND-YEAR COST OF RAISING HEIFERS.

In Table XII are presented the records that are available on four groups the second year, to show a comparison for the different classes of feed and other factors making up the cost of raising a heifer the second year. Approximately four-fifths of the feed cost is for roughage and one-fifth for pasture. There is here a wider range in cost of feed than for the first year. A smaller ration was fed the 1907 group, thus accounting for the lowest cost of $11.96. However, the results obtained were the least satisfactory. The cost of feed for the other three groups ranges from $15.43 to $17.36. The increase for the last two years is caused by an increase in feed prices. The cost of labor ranges from $2.72 to $4.27 and is due to changes in natural conditions, the same as for the first-year groups. The other costs are nearly the same as for the first year and range from $5.62 to $8.04. The rise in the prices of feeds for 1910 and 1911 does not change the relative proportion of feed to labor and other costs.

The total net cost of raising the heifer the second year ranges from $16 to $23.

TABLE XII.—*Comparison of the cost of raising four groups of heifers the second year, on the basis of the cost per head.*

Item.	1907 group (average number, 26.54).		1908 group (average number, 24.72).		1909 group (average number, 17.20).		1910 group (average number, 12.70).	
	Actual cost.	Per cent.	Actual cost.	Per cent.	Actual cost.	Per cent.	Actual cost.	Per cent.
Roughage	$9.56	80	$12.84	83.2	$12.55	78	$13.55	78.2
Grain mixture	.....	.....	.12	.8	.....	.....	.....	.....
Pasture	2.40	20	2.47	16	3.56	22	3.80	21.8
Total feed cost.	11.96	100	15.43	100	16.11	100	17.35	100
Feed	11.96	63.5	15.43	64.6	16.11	68.6	17.35	66.8
Labor	3.40	18.1	4.27	17.9	2.86	12.2	2.72	10.5
Other costs	5.62	18.4	6.34	17.5	6.72	19.2	8.04	22.7
All costs	20.98	100	26.04	100	25.69	100	28.11	100
Credit, manure	5.00	.....	5.00	.....	5.00	.....	5.00	.....
Net cost of raising	15.98	.....	21.04	.....	20.69	.....	23.11	.....

THE COST OF RAISING A HEIFER FOR TWO FULL YEARS.

Table XIII is a combination of the cost figures shown by year groups in Tables XI and XII, in order to bring out the relative proportions of the various feeds and other items of cost for the

different groups. There is a marked uniformity as to group totals and proportions for the three years. Variations for feed, labor, and other costs in the first-year group seem to have been balanced by the variations the second year, thus making the two totals more uniform than the totals for either year alone. Milk stands out as the largest single item of feed cost, ranging about 30 per cent for each group, or practically one-third the total feed cost. Milk and concentrates appear only in the first year's feeding period, yet they make up nearly 50 per cent of the total feed cost. In raising the 1910 group the tendency seems to have been to increase the roughage and decrease the grain. However, the change does not in this case materially affect the total feed cost per head.

TABLE XIII.—*Comparison of the cost of raising heifers for two years (1908, 1909, and 1910 groups).*

Item.	1908 group.		1909 group.		1910 group.	
	Actual cost.	Per cent.	Actual cost.	Per cent.	Actual cost.	Per cent.
Whole milk	$4.74	12.1	$5.28	12.8	$7.36	17.4
Skim milk	7.89	20	6.33	15.6	6.91	16.3
Roughage	16.60	42.1	16.81	41.3	18.40	43.6
Grain	6.44	16.3	6.94	17	4.45	10.5
Pasture	3.73	9.5	5.39	13.3	5.19	12.2
Total feed cost	39.40	100	40.69	100	42.40	100
Feed	39.40	65.5	40.69	65.5	42.40	65.4
Labor	7.86	13	8.00	12.9	7.56	11.6
Other costs	12.91	21.5	13.37	21.6	14.91	23
All costs	60.17	100	62.06	100	64.87	100
Credit, manure	8.00	.....	8.00	.....	8.00	.....
Cost of raising heifer	52.17	.....	54.06	.....	56.87	.....
Initial value	6.30	.....	7.00	.....	7.83	.....
Total net cost of production	58.47	.....	61.06	.....	64.70	.....

There is a gradual increase in the net cost of production for each successive group, but the proportions of feed, labor, and other costs, as indicated by the percentages (Table XIII), have remained practically constant.

The value of the manure for the two years practically offsets the expense for labor. On the other hand, the expense for labor and other costs combined would not be offset by two and one-half times the value of the manure. To get an accurate record of all the labor is perhaps the most difficult task for the farmer of all the items that must be recorded to determine the cost of producing a dairy cow. It would seem from the results on the Brigham farm that the value of manure will offset the cost of labor, making it necessary only to keep a record of feed and the items that make up the group of other costs. The gradual increase of the initial value for the three groups is due to a larger number of pure-bred calves.

FEED PRICES.

The feed costs given in all the foregoing tables are based on the current monthly feed prices, in order to eliminate any errors that might result from wide fluctuations in prices during a year. However, for purposes of comparison yearly feed prices are shown in Table XIV for the period covered by the records on the different groups presented in the previous tables:

TABLE XIV.—*Average yearly feed prices per ton at the Brigham farm from Sept. 1, 1908, to Aug. 31, 1912.*

Feeds.	1908–9	1909–10	1910–11	1911–12
Whole milk	$30.70	$30.56	$32.00	$29.26
Skim milk	4.00	4.00	4.00	4.00
Grain:				
Bran	25.26	22.00 22.08	21.54	.....
Shelled corn	25.00	.....	22.54	.....
Oats	.....	24.90 25.00	.....	.....
Barley and oats	30.00	.....	.....	.....
Ground barley	.....	25.30	.....	.....
Oil meal	35.00	41.00 39.60	40.00	.....
Mixture	.....	.....	.....	27.40
Roughage:				
Mixed hay	8.00	8.00	8.00	10.00
Alfalfa	.....	12.00	12.00	15.00
Corn stover	4.00	.....	4.32	4.00
Silage	.....	3.88 3.97	4.00	4.00
Corn fodder (cut green)	.....	3.69	.....	.....
Pasture: [1]				
First year	.40	.43	.50	.50
Second year	.50	.50	.64	.75

[1] Average price per head per month.

The yearly prices are obtained by dividing the total quantity of feed consumed during the year by the total cost. The prices of feeds did not change materially during the four years. However, two slightly different yearly prices must be considered in determining the feed costs shown in Table XIII by any one group of heifers. The hay prices were advanced the last year, and silage was increased when the cost of growing it was found to be not less than $4 per ton. The grain prices represent normal variations. The lower prices for bran were due to purchases in carload lots. The price of pasture was increased to correspond with the rise in the prices of other feeds.

Considering that feed makes up practically two-thirds of the total cost of growing a heifer (Table XIII), it is apparent that a general increase or decrease in prices would materially affect the total cost. An increase of 10 per cent in the price of feeds would add approximately $4 to the cost of the heifer. This factor alone will cause a wide variation in the cost of growing heifers in different sections of the country, owing to the widely varying prices of the principal farm feeds.

It is of interest to compare the cost of growing heifers on the Brigham farm with the results on the cost of feeding heifers published in Bulletin 63 of the Storrs Agricultural Experiment Station. In the one case the heifers were grown under actual farm conditions; in the other under careful supervision at a State experiment station. In each case the cost of feed is very nearly the same. The first-year feed cost at the Storrs station was nearly $28, while at the Brigham farm it was approximately $25. When allowance is made for the higher feed prices charged at the Storrs station the feed costs for the first year check very closely. The feed cost for the second year at the farm is somewhat lower than at the Storrs station, owing to the fact that Mr. Brigham fed no grain during the second year.

The cost items other than for feed have been estimated at the Storrs station, whereas these same items are based upon accurate data for the Brigham farm. At the Storrs station the total cost is given at $66 for the heifer 2 years of age, while the Brigham records show the cost to be $61.41. Had Mr. Brigham credited the calves with only $5 for manure, as was done at the Storrs station, the net cost of the heifer would have been increased to $64.41. Thus the results of these investigations, carried on under different conditions and in different sections of the country, substantiate each other, and in each case they indicate that a heifer can not be raised properly up to 2 years of age for less than $60.

Although the practice on the Brigham farm is to have the heifers enter the herd at the age of 2 years, in many dairies they do not freshen until about the age of 2½ years. In such cases the cost of the heifers at milking age will be nearer $75 than $61.41.

SUMMARY.

The average net cost of a dairy heifer 1 year old is $39.52, which consists of its initial value, $7.04; feed, $24.67; labor, $4.45; other costs, $6.36; total, $42.52; credit for manure, $3.

The average net cost of a dairy heifer 2 years old is $61.41, which consists of its initial value, $7.04; feed, $40.83; labor, $7.81; other costs, $13.73; total, $69.41; credit for manure, $8.

The most important item of cost is the feed, which is 65.5 per cent, or nearly two-thirds of the total net cost of the heifer. Labor forms 12.5 per cent, and all other costs 22 per cent.

One-half of the feed cost the first year and one-third for the full two years is for whole and skim milk.

By far the most expensive period in the life of the calf is the first four weeks, the cost being nearly double that for any other four-week period. This high cost is occasioned by its being dependent almost entirely upon whole milk.

The man labor required in raising a heifer is about 40 hours during the first year and 23 hours the second year. The total cost of man and horse labor for the two years is close to $8. The manure produced during the two years has been valued at $8; consequently, the cost of labor is practically offset by the value of the manure.

The item "Other costs" consists of expenses usually overlooked in estimating costs. These are interest, charge for the use of buildings and equipment, expense for bedding, miscellaneous expenses, a share of the general expenses for the entire farm business, and a charge to cover losses by death and discarding. The total for these forms nearly one-fifth of the total cost of the 2-year-old heifer.

If the cost of raising a dairy heifer on the Brigham farm is typical throughout the dairy regions, the usual price received for such heifers will not pay the cost of producing them. This is especially true of a heifer sold at 1 year of age.

These investigations of the cost of producing a dairy heifer seem to indicate that a heifer entering the dairy herd at 2 years of age must be worth at least $60 to cover cost only. It would appear that a farmer can not afford to raise a heifer calf that will not sell for more than $60 at 2 years of age.

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